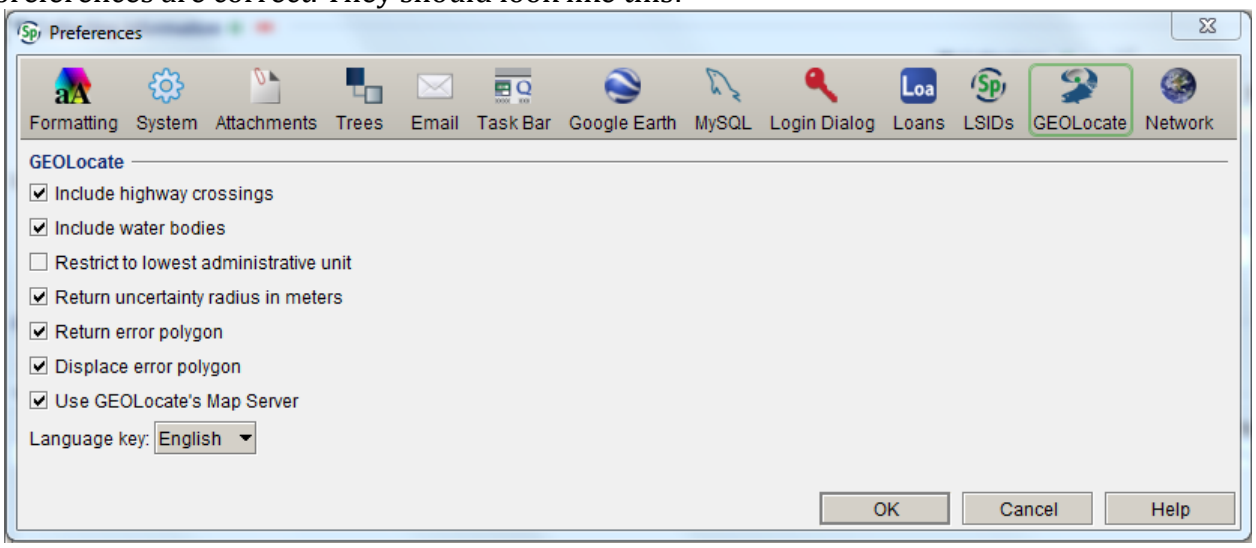
Georeferencing Protocol KUMIP

Setting up in Specify

1) Go to Edit>Preferences in the Specify menu at the top and make sure that your GEOLocate preferences are correct. They should look like this:



2) Import the "Georef Search" query (on the server at Divisions (R:)>Invert Paleo>Specify Stuff)
   Only georeference proofread localities – i.e. make sure "Checked By" is NOT empty.
   This query will sort your localities alphabetically by Country, then State, then County, and finally by location.
3) Run the query for the country or state you are interested in, e.g. Kansas
4) Scan through the results to identify a county that hasn't been georeferenced

11082	37.6239320000	-96.1473410000	United States	Kansas	Greenwood	SE1/4 SEC 12 T28S R11E
2206	37.8451715000	-96.1138146000	United States	Kansas	Greenwood	SEC 29 T25S R12E
2207	37.8451715000	-96.1138146000	United States	Kansas	Greenwood	SEC 29 T25S R12E
7164	38.1619930000	-96.2800810000	United States	Kansas	Greenwood	SW1/4 Sec 02 T22S R10E
11080	37.7981030000	-96.1387430000	United States	Kansas	Greenwood	SW1/4 sec 07 T26S R12E
1235	37.8424630000	-96.1732630000	United States	Kansas	Greenwood	SW1/4 sec 26 T25S R11E
888	37.7717166000	-96.0428454000	United States	Kansas	Greenwood	Sec 24 T26S R12E
8206 BIO	37.7717166000	-96.0428454000	United States	Kansas	Greenwood	Sec 24 T26S R12E
8208 BIO	37.7717166000	-96.0428454000	United States	Kansas	Greenwood	Sec 24 T26S R12E
11092	37.6923104000	-96.0879644000	United States	Kansas	Greenwood	Sec ? T27S R12E
HPS 80-1	37.9798120000	-96.1148810000	United States	Kansas	Greenwood	Southern part of the Hamilton Quarry, NE1/4 NE1/4 SEC 08 T24S R12E
11820	37.8402270000	-96.1527830000	United States	Kansas	Greenwood	Stop 9, SE1/4 SW1/4 Sec 25 T25S R11E
11820	37.8402270000	-96.1527830000	United States	Kansas	Greenwood	Stop 9, SE1/4 SW1/4 Sec 25 T25S R11E
HPS89-1	37.9833300000	-96.1136360000	United States	Kansas	Greenwood	Surface collection at (Main?) Hamilton Quarry, approx 2.5 mi east of Hamil
2588	37.8371820000	-96.0497680000	United States	Kansas	Greenwood	US 54, SW1/4 corner sec 25 T25S R12E
4223	37.7986870000	-96.4858500000	United States	Kansas	Greenwood	W of Reece
17 BIO	37.7986870000	-96.4858500000	United States	Kansas	Greenwood	West of Reese
485	37.8099440000	-96.4775240000	United States	Kansas	Greenwood?	US hwy 54, NW of Reece
ALM35-8			United States	Kansas	Hamilton	Approx 9 mi. NW of Syracuse
295	39.0676730000	-94.6039920000	United States	Kansas	Jackson	33rd and Roanoke, Kansas City
MIP91-31			United States	Kansas	Jefferson	+/- 1/2 mile east of east end of dam at Perry Lake
11566			United States	Kansas	Jefferson	+/- 4 mi N of Winchester. On branch of Crooked Creek or joining to. About
10281	39.1890960000	-95.5312450000	United States	Kansas	Jefferson	1 mile E of Meriden, SW1/4 SW1/4 Sec 09 T10S R17E
4879	39.0932500000	-95.3403200000	United States	Kansas	Jefferson	10 miles SW of McLouth
4642			United States	Kansas	Jefferson	11 miles S and 1/2 mile W of Oskaloosa
6878			United States	Kansas	Jefferson	2 mi N of Oskaloosa
2915			United States	Kansas	Jefferson	2 miles NW of Winchester
108	39.1888900000	-95.5694400000	United States	Kansas	Jefferson	2 miles S and 2 miles E of Meriden
109	39.1888900000	-95.5694400000	United States	Kansas	Jefferson	2 miles S and 2 miles E of Meriden
109	39.1888900000	-95.5694400000	United States	Kansas	Jefferson	2 miles S and 2 miles E of Meriden
6911			United States	Kansas	Jefferson	2 miles west of Oskaloosa
7354			United States	Kansas	Jefferson	3 mi E of Meridan, SW1/4 SW1/4 Sec 09 T10S R17E
7064			United States	Kansas	Jefferson	3 mi N of Winchester
110	39.1381536000	-95.5508124000	United States	Kansas	Jefferson	3.5 mi S, 1 mi E of Meriden
110	39.1381536000	-95.5508124000	United States	Kansas	Jefferson	3.5 mi S, 1 mi E of Meriden
MIP-2013-110	39.1958100000	-95.1332400000	United States	Kansas	Jefferson	4 mi E of McLouth
4882			United States	Kansas	Jefferson	4 miles E of McClouth
4148			United States	Kansas	Jefferson	4 miles E of Nortonville
619			United States	Kansas	Jefferson	5 miles W of Oskaloosa
6866			United States	Kansas	Jefferson	8 mi N of Oskaloosa
4797			United States	Kansas	Jefferson	8 miles N of Oskaloosa
4835			United States	Kansas	Jefferson	8 miles N of Oskaloosa
6869			United States	Kansas	Jefferson	8 miles NE Winchester
MIP-2001-37			United States	Kansas	Jefferson	8 miles north of Oskaloosa
4881			United States	Kansas	Jefferson	About 1 mile E of Valley Falls, CCC quarry

Figure 1 For example, Greenwood County is complete, but Jefferson County is not

5) Refine the search further by identifying some shared named place. For example, find all the localities that are in or near a particular town – this will allow you to catch duplicate localities and only georeference them once. It also allows you to use the same named place extent and coordinates for localities that differ only by offset etc.
6) Run the query again with the named place in location (e.g. Meriden), but take out the county name from the query – that way you will catch any duplicate or similar localities where the original locality card did not specify the county name.

Search Results - 6

Checked By	LocalityNum	Latitude1	Longitude1	Country	State	County	Location
Melissa Brooks	MIP-2013-146			United States	Kansas		±3 Mi E of Meriden, SW SW Sec 9, T10S, R7E
Una Farrell	10281	39.1890960000	-95.5312450000	United States	Kansas	Jefferson	1 mile E of Meriden, SW1/4 SW1/4 Sec 09 T10S R17E
Erin Saupe	108	39.1888900000	-95.5694400000	United States	Kansas	Jefferson	2 miles S and 2 miles E of Meriden
Erin Saupe	109	39.1888900000	-95.5694400000	United States	Kansas	Jefferson	2 miles S and 2 miles E of Meriden
Erin Saupe	110	39.1381536000	-95.5508124000	United States	Kansas	Jefferson	3.5 mi S, 1 mi E of Meriden

Figure 2 For example, the first location here refers to the same 'Meriden 'as the rest, but no county was reported. Note also that 108 and 109 are duplicates, which will only need to be georeferenced once.

7) Once you have a set of localities to work on, double click on the first locality you want to geoereference in the query results, click edit in the bottom right-hand corner and then click the edit pen next to the locality (see below).

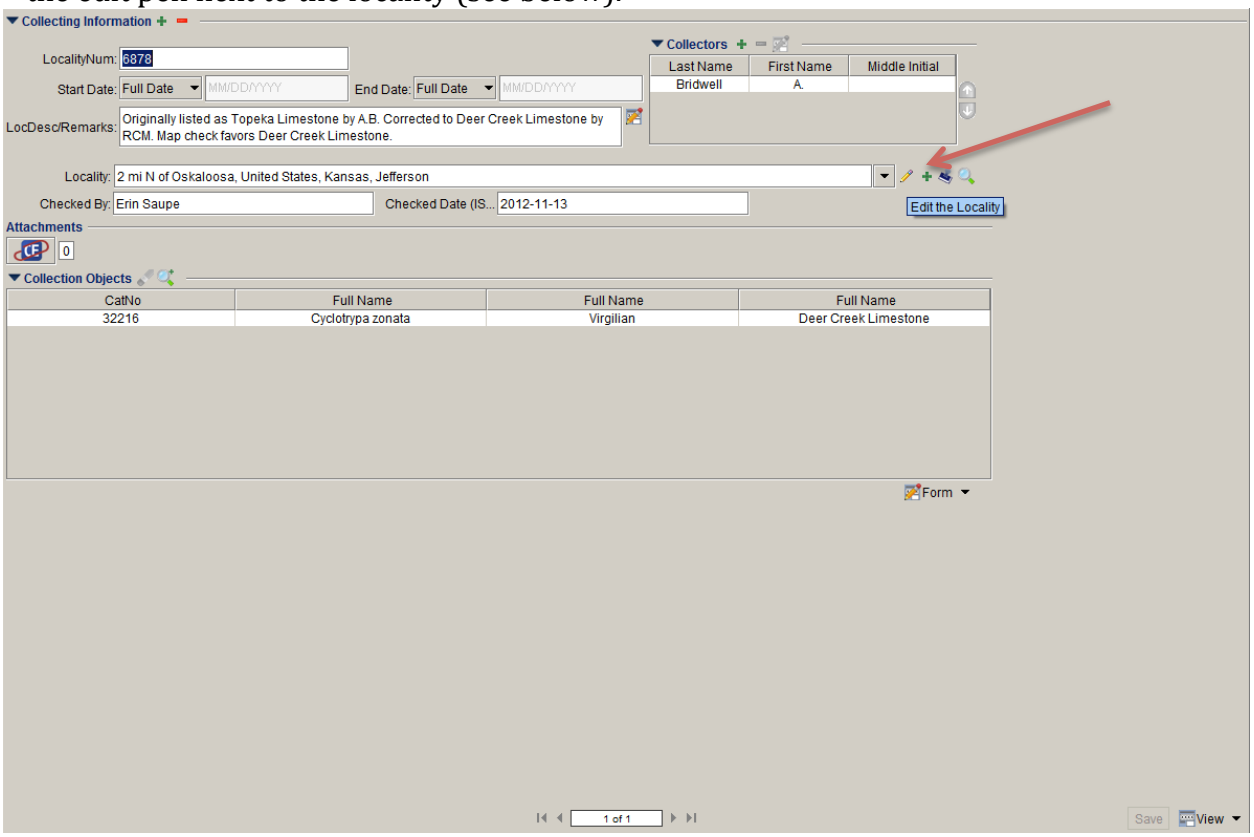


Figure 3 A collecting event form. Note the edit pen to the right of the locality field. Click this to bring up the locality form (DO NOT try to edit the locality on this page).

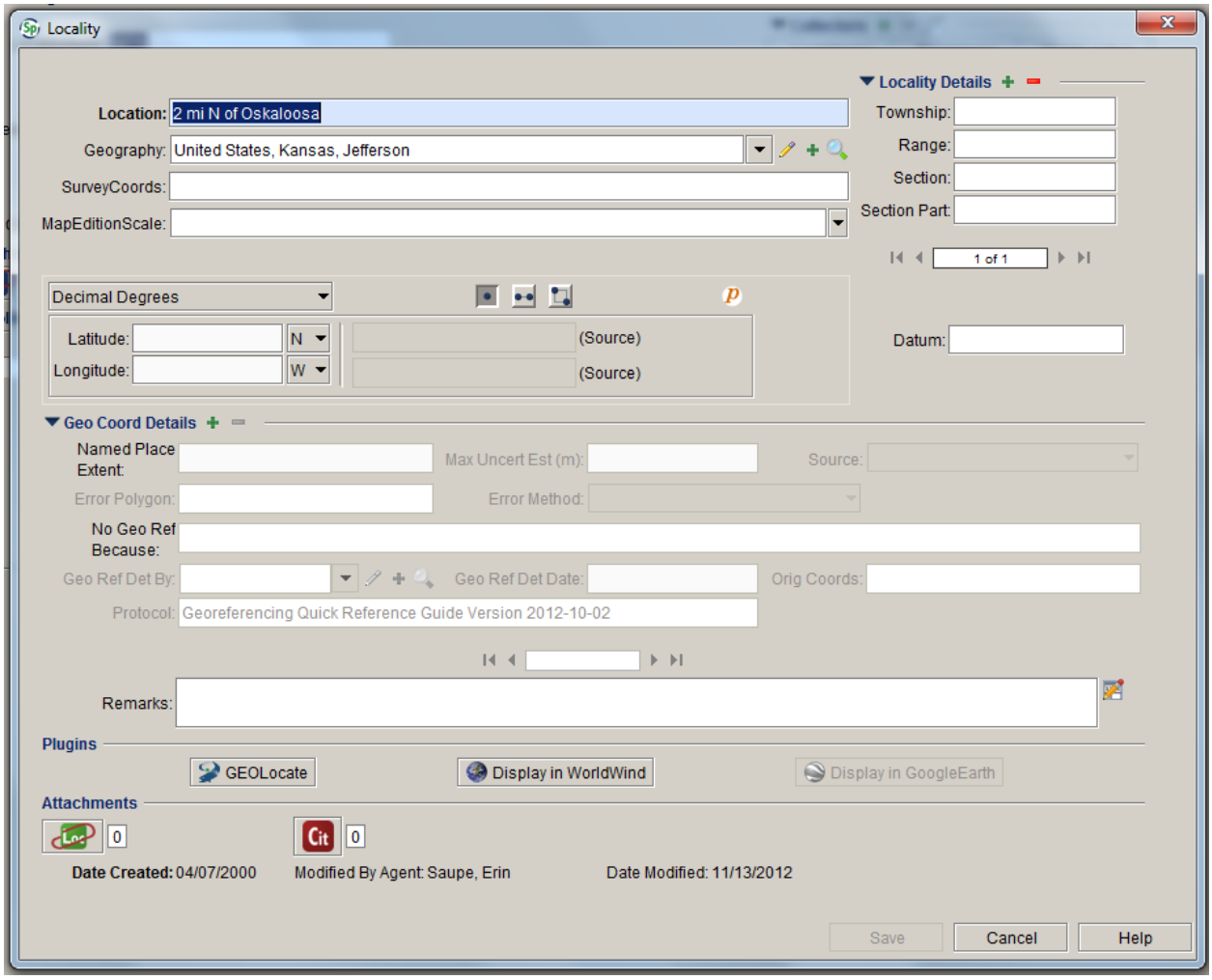


Figure 4 The locality form, ready to georeference

We georeference using the Point-Radius method, following the MaNIS/ ORNIS/HerpNet georeferencing guidelines, and specifically the Georeferencing Quick Reference Guide (Version 2012-10-02).

We use a number of resources for georeferencing – chiefly GEOLocate (through Specify and online), Google Maps, Earth Point+Google Earth. See the end of this document for a list of useful websites.

Locality Fields

1) *Location* – the descriptive locality e.g. Lawrence, 2 miles N of Lawrence, 2 miles N and 3 miles E of Lawrence etc. (**this field should include TRS** – if there are Township, Range, Section data reported in the SurveyCoords, copy and paste them to the end of the location as well)
2) *Geography* - in most cases: Country, State and County.
3) *SurveyCoords* – this is a legacy field from Specify5 for reporting township, range and section or other kinds of survey coordinates. If you have TRS make sure it is written in this field **AND** in the location field **AND** in the Locality Details
4) *Locality Details* – specifically for TRS. If there are TRS data in the SurveyCoords, make sure they are also entered here. The final field (section part) should include any details about the locality within the section. Examples could include:

   NE¼
   NE¼ SE ¼
   NE¼ SE ¼ SW¼
   C N line
   mid W1/2
   center

   Double check that underneath *Locality Details* the box reads "1 of 1". If you see "1 of 2" use the red minus button to remove one of the duplicates.

5) *MapEditionScale* – if the map, edition and scale is reported on the locality card it should appear here, this is relevant if you have coordinates already specified by the collector.

Georeferencing fields

1) *Latitude and Longitude* – report in decimal degrees, unless the coordinates were originally. specified, in which case they should be in the format used by the collector.
2) *Datum* - in most cases the datum will be WGS84, but don't assume.
3) *Named place extent* – the linear extent (in meters) of the named place.
4) *Max Uncertainty Est* - uncertainty radius in meters (this will always be equal to or greater than the named place extent).
5) *Source* – where did you read the lat-long from
6) *Error method* – where you got the error radius from
7) *No Geo Ref Because* - if you couldn't georeference, write the reason here (and make sure to record your name and date in the following two fields)
8) *Geo Ref Det By* - your name
9) *Geo Ref Det Date* – date you georeferenced on
10) *Protocol* - automatically filled in to report the current version of the quick reference guide.
11) *Remarks* – write a short description of what you did, note any assumptions, any corrections you made, other sources (papers, websites etc.) you consulted and so on. If you used a particular website to find information, put the address in here and note the date accessed.

First you must identify the type of locality you have (e.g., named place –bounded area, near a named place, offset at a heading) as this will determine which tools you select to georeference. For each type, see examples below. If a locality has multiple parts, first determine whether they are consistent and then georeference as precisely as possible, see example on page 22.

Originally specified data

At the moment we are not altering lat-longs already in the database that were provided by the collector. We don't have many such records – if you come across one, then choose "originally specified" as the source, enter the collectors name as the georeferencer, and the date of collection as the date georeferenced, and note that the coordinates were provided by the collector in the remarks.

Named Place (Bounded Area) *e.g. Lawrence, Kansas*

Start by trying **GEOLocate** through Specify (button on the lower left on the locality form)

GEOLocate will plot Lat-long, Uncertainty and a polygon for many towns, cities and some other named places. Check that the results match the geography information. If you are confident that you have the right place, click accept and it will automatically populate the lat-long and uncertainty fields in Specify.

If the uncertainty doesn't quite fit with the polygon, you can edit it (click "uncertainty radius" and adjust using the blue arrow), and expand it to fit.

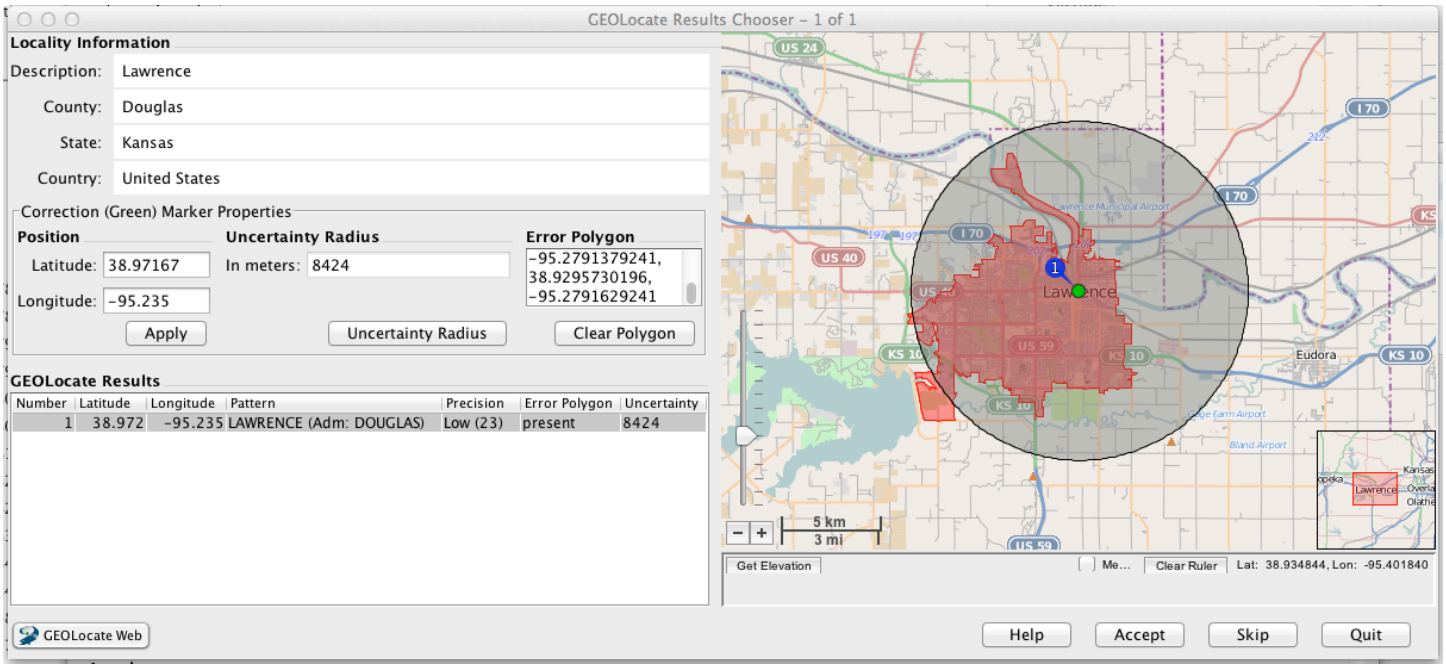


Figure 5 Named place (bounded area) - GEOLocate returns a lat-long, uncertainty and polygon.

Be sure to also fill in the other fields - datum (WGS84), georeferenced by, georeferenced date, named place extent (same as uncertainty in this case), Geo Ref Method (GEOLocate), Error Method (GEOLocate) and remarks (e.g. "Accepted lat-long and uncertainty from GEOLocate"). See below for the completed georeference.

We don't, in general, worry about having a polygon for our georeferences (we use the point-radius method). However, in this type of locality, where the polygon is produced by GEOLocate and can simply be "accepted" then we keep the information.

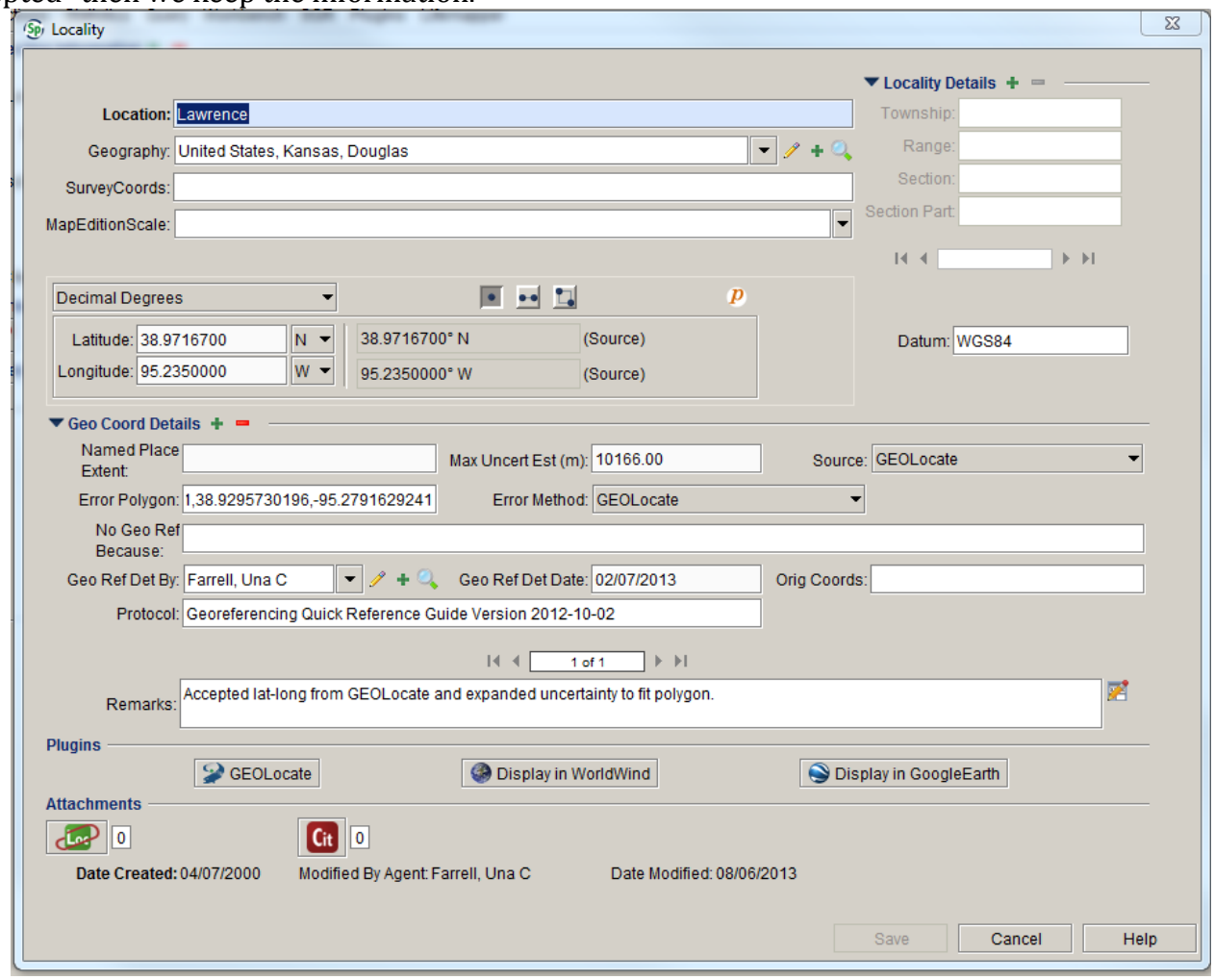


Figure 6 Named Place (bounded area) - completed georeference for Lawrence, Kansas

If GEOLocate does not find the named place further research is needed. Consult the list of websites at the end of this document, but in general:

1) try Google, Google Maps, ACME mapper or other gazetteers to find the lat-long
2) place lat-long at the center of the named place and measure uncertainty to the furthest edge.

Named Place (Undefined Area) *e.g. Midland, Douglas County, Kansas*

Start by trying **GEOLocate** through Specify (button on the lower left on the locality form)

WARNING! If the named place is an undefined area, GEOLocate may return lat-long with no uncertainty, or with a standard uncertainty (e.g. **3036m for a town, 1807m for a hill**).

If the nearest named place is obvious on the map, then resize the uncertainty to measure half way between the two named places. Report the nearest named place in the remarks.

Often, the map layers on GEOLocate Web will give you more named places to work with. Click GEOLocate Web (button in the lower left hand corner), which will open in a separate browser. Switch between map layers to find the nearest named place – the USGS topo-maps are particularly useful.

GEOLocate Web is not directly connected to Specify, so you will have to copy and paste the results.

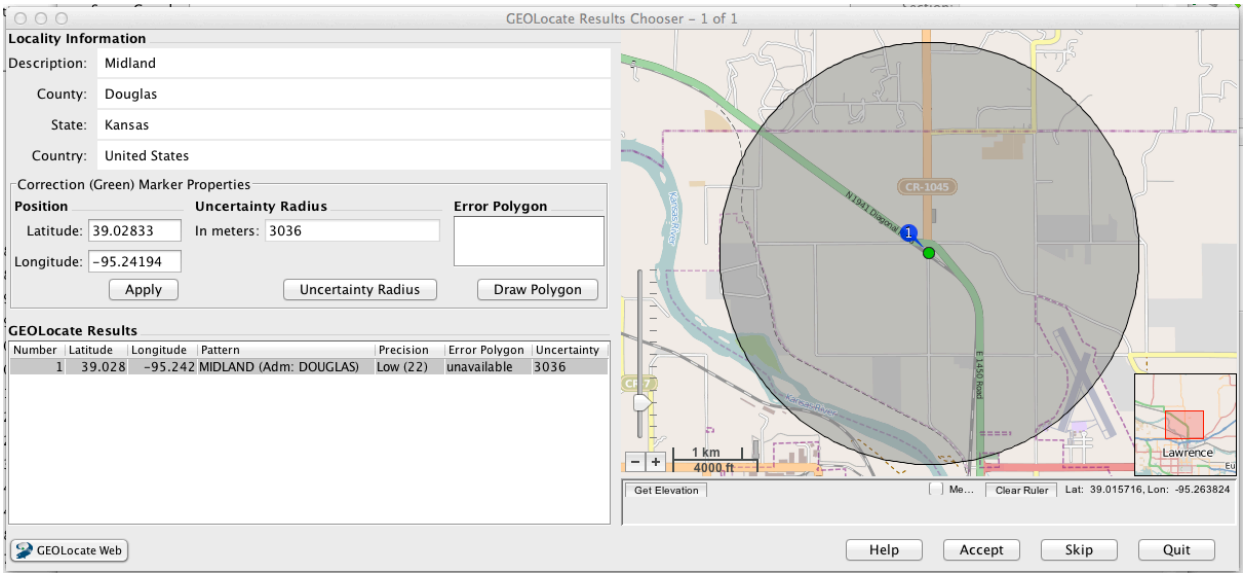


Figure 7 Named Place (Undefined Area)-note that GEOLocate plots an uncertainty but no polygon, and the uncertainty is 3036, which is a standard uncertainty for a town in GEOLocate. Don't accept this result: measure uncertainty half way to the nearest named place.

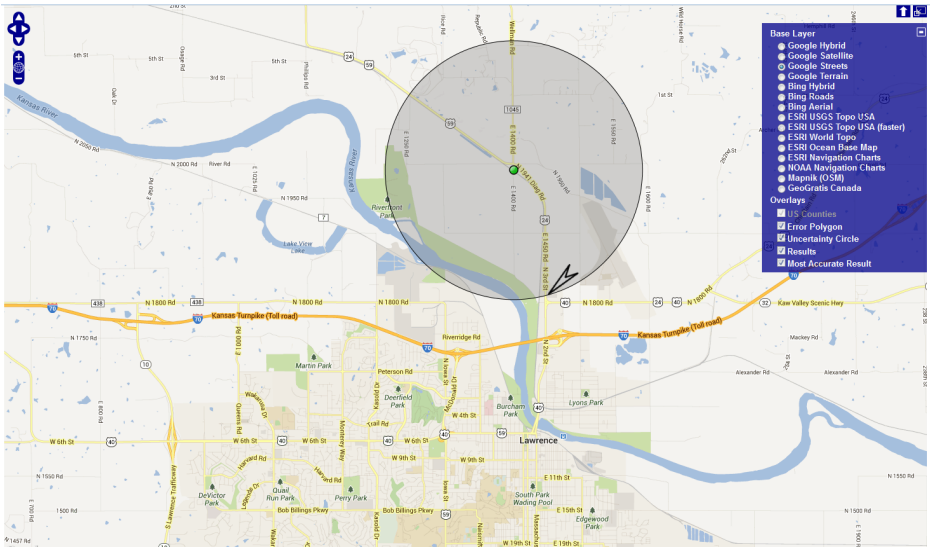


Figure 8 Named Place (Undefined Area) - Midland, Douglas, Kansas with uncertainty measured to the nearest named place, Lawrence

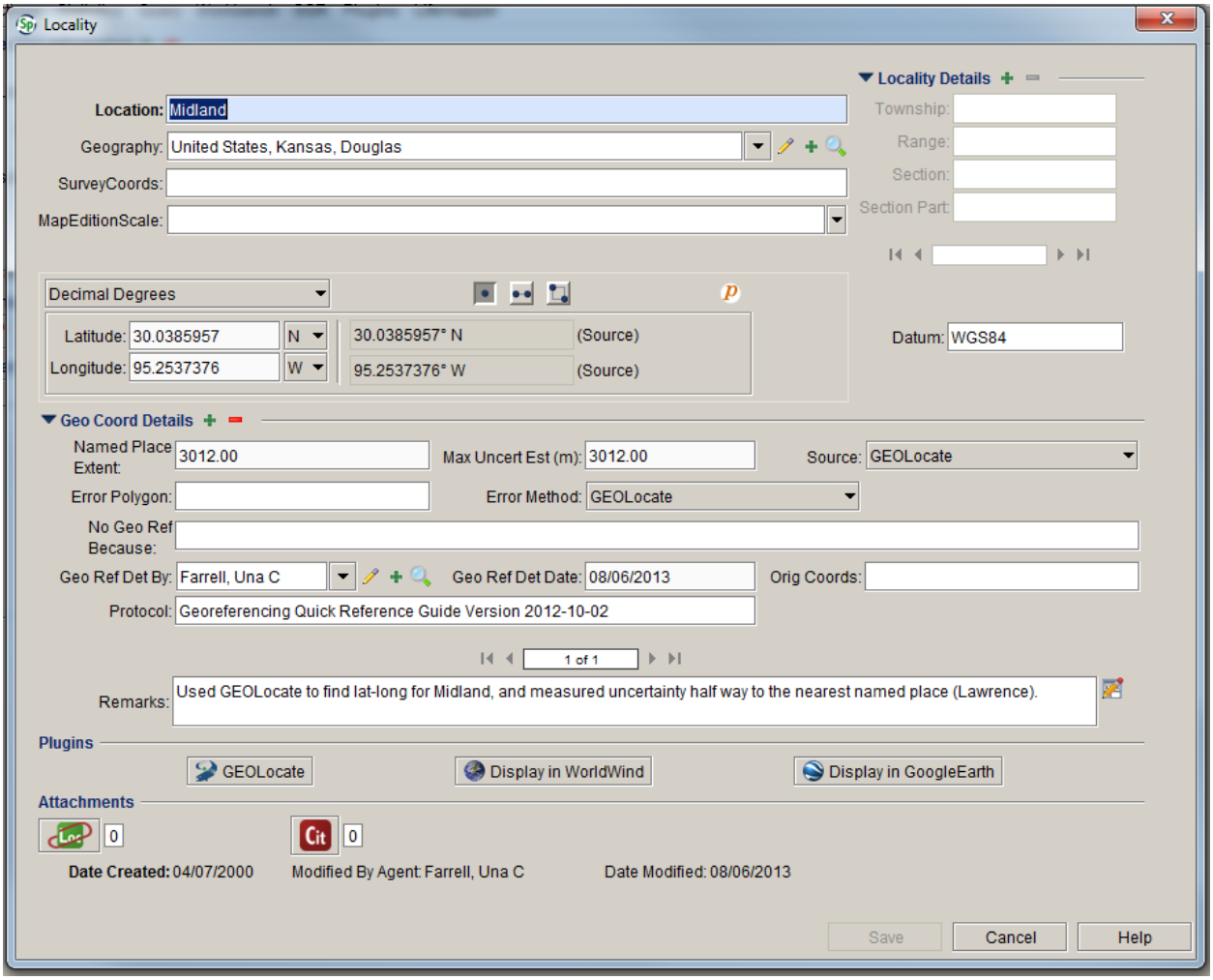


Figure 9 Named Place, unbounded area - completed Georeference for Midland, Douglas, Kansas

If GEOLocate does not return a result, more research is needed.

1) Try Google, Google Maps, ACME mapper or other gazetteers to find the lat-long. Copy and Paste.
2) Measured uncertainty as half the distance to the nearest named place, and report the nearest named place in the remarks.

Named Place (Street Address, Ranch, Farm, Quarry, Intersection)

GEOLocate will generally not give you results for these kinds of location – follow the protocol from the Georeferencing Quick Reference Guide.

Google Maps is often best for **street addresses** and **intersections**. Note that street addresses may or may not be exactly correct on google – in general measure uncertainty as half a city block unless you are sure of the result. Intersections have standard uncertainties:

10m for a one-lane highway
20m for a four-lane highway,
30m for a large highway with a median.

Ranches and **farms** are often quite difficult to locate - the topomap layers on GEOLocate can help and googling can sometimes give you results, but many times you will have to georeference using whatever other geographic information you have. This is why it is important to query by named place – in many cases you will find extra information from another locality. For example, one locality might say "O'Brien Farm near Baldwin, Douglas, Kansas" and another may say "O'Brien Farm, 2.5 miles NE of Baldwin City, Douglas, Kansas". Since the geography closely matches, you can assume that the O'Brien Farm near Baldwin is in fact 2.5 miles NE of Baldwin, and georeference accordingly. DO NOT change the location description, but note how and where you got the extra information in the remarks field.

Quarries are common in our database, but difficult to find if you just have a name as they often change owners through time, or have been closed. The topomap layer in GEOLocate is useful if you have some other information such as distance from a town. Quarries may be visible on Google satellite view, but note that many have been filled in/grown over/are now small lakes or ponds. http://quarriesandbeyond.org/ and http://mines.findthedata.org/ can be useful, and if the quarry was a good collecting spot then a literature search can also help. Furthermore, we will often have multiple localities that mention the same quarry with varying amounts of detailed description – Fredonia Cement Plant Quarry, or the Bert Ross Quarry, for example. If you know the lithostratigraphy, downloading geological map layers for Google Earth (http://mrdata.usgs.gov/geology/state/) can be helpful – though note that a geological map just gives surface geology and, depending on the extent of the excavation, you could be sampling from formations or members below.

Named Place: River, Stream

1) Start by trying GEOLocate through Specify (button on the lower left on the locality form)

CAUTION! Note that there are often multiple rivers and streams with the same name, even in the same state. Here are the results for "Spring Creek" in Kansas, for example.

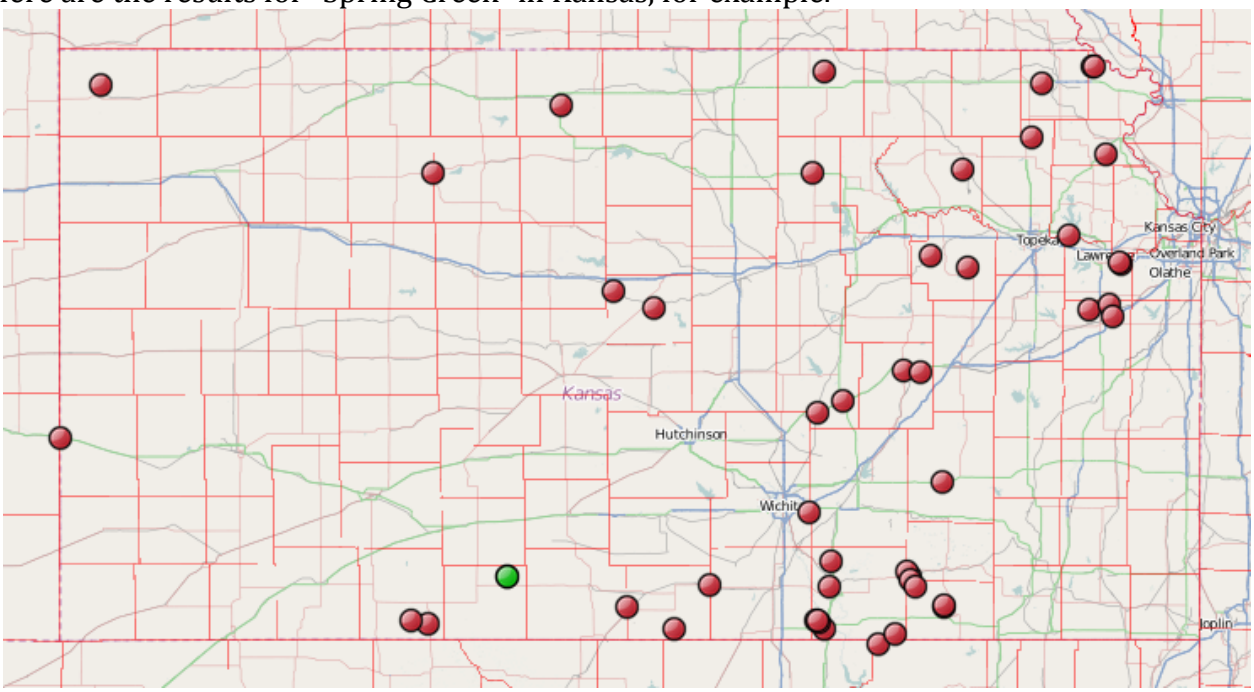


Figure 10 Spring Creek, Kansas

With a single river, Geolocate will also return multiple points along the river (Figure 11). Use the geography to determine where you put the lat-long (e.g. Figure 12)

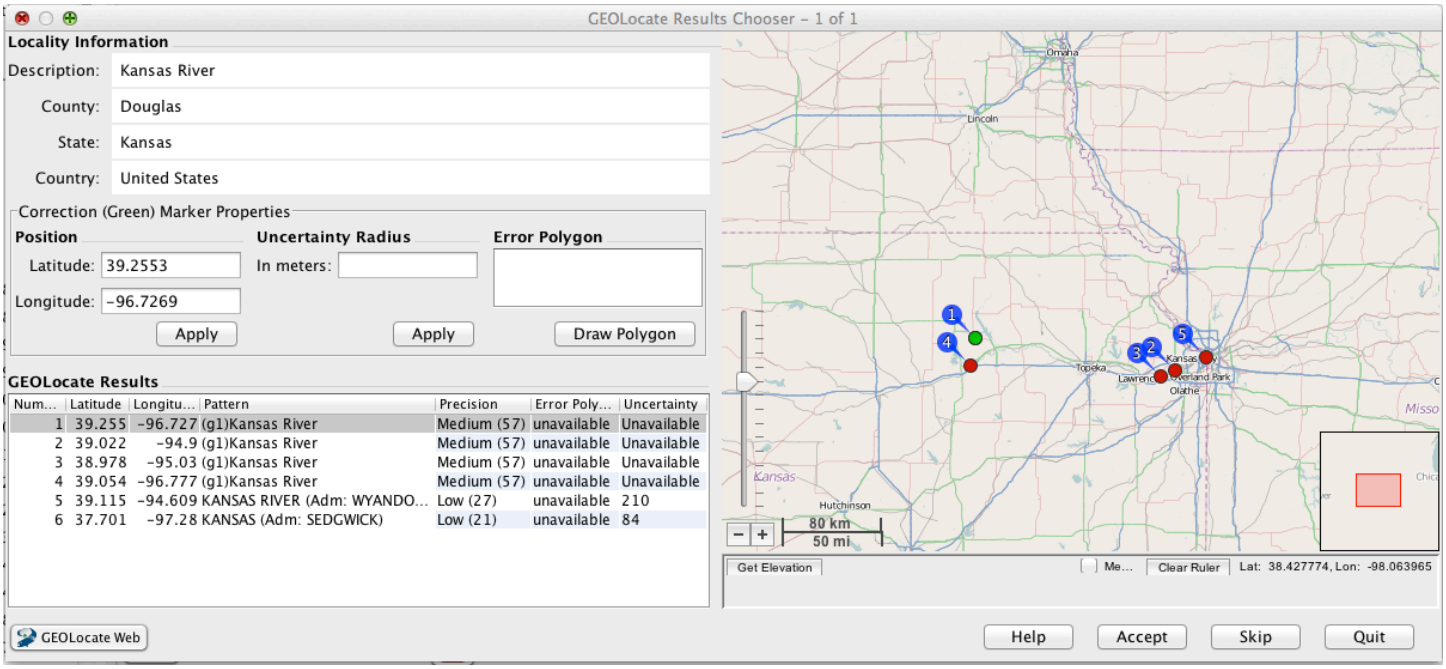


Figure 11 GEOLocate results for the Kansas River

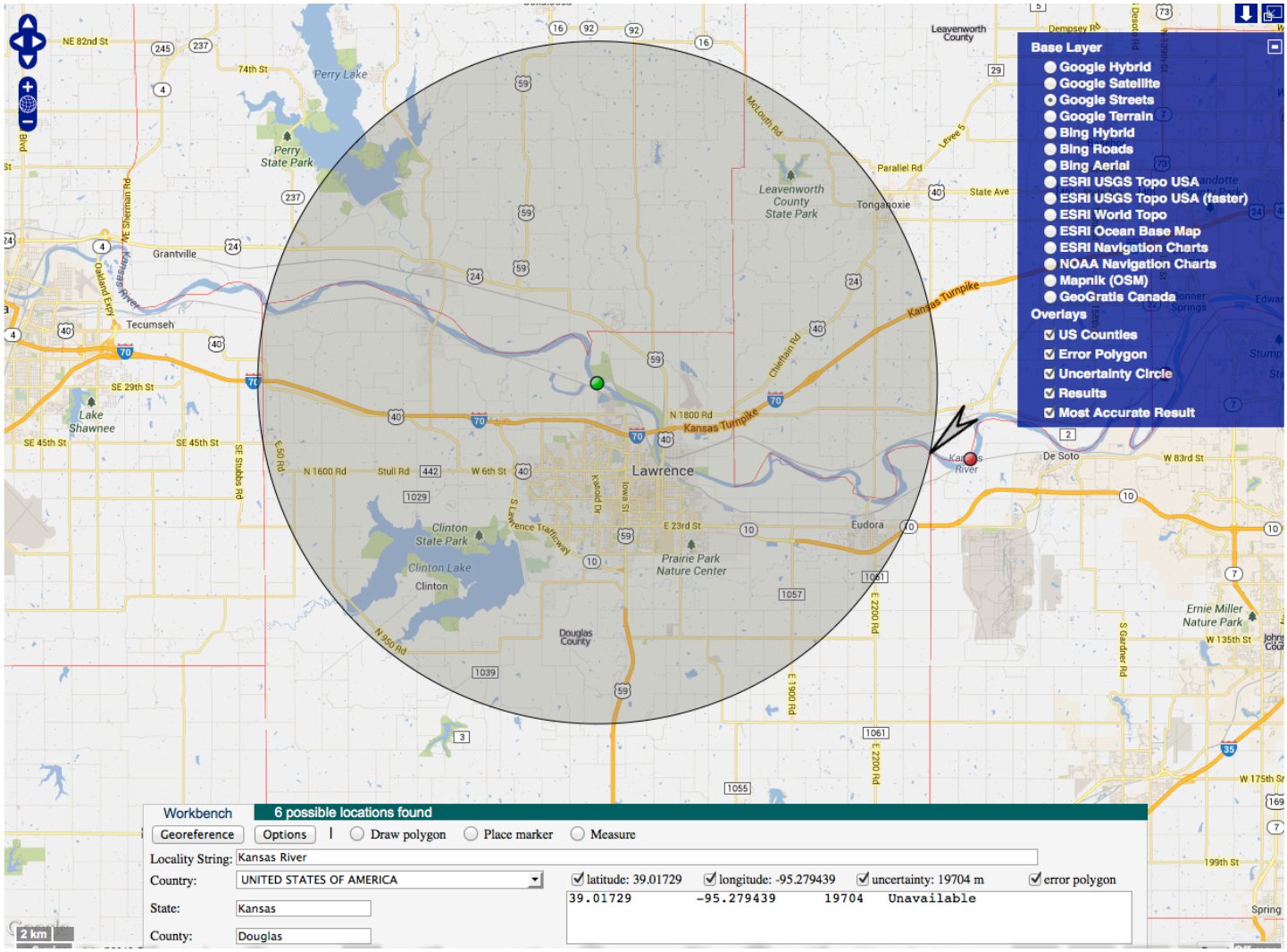


Figure 12 The extent of the Kansas River within Douglas County – place the lat-long on the river as close to the center point as possible

Named Place (Near a Named Place) *e.g. near Lawrence, Kansas*

Use GEOLocate to find the named place, place lat-long at the center of the named place and measure uncertainty half way to the nearest named place. Note the nearest named place in the remarks field.

Named Place (Between two places) *e.g. between Lawrence and Topeka, Kansas*

Use GEOLocate to find one of the named places, move the lat-long until it falls exactly between the two named places (usually you will need to open the web browser version), and resize the uncertainty so that the radius is half the distance between the two named places (Figure 13).

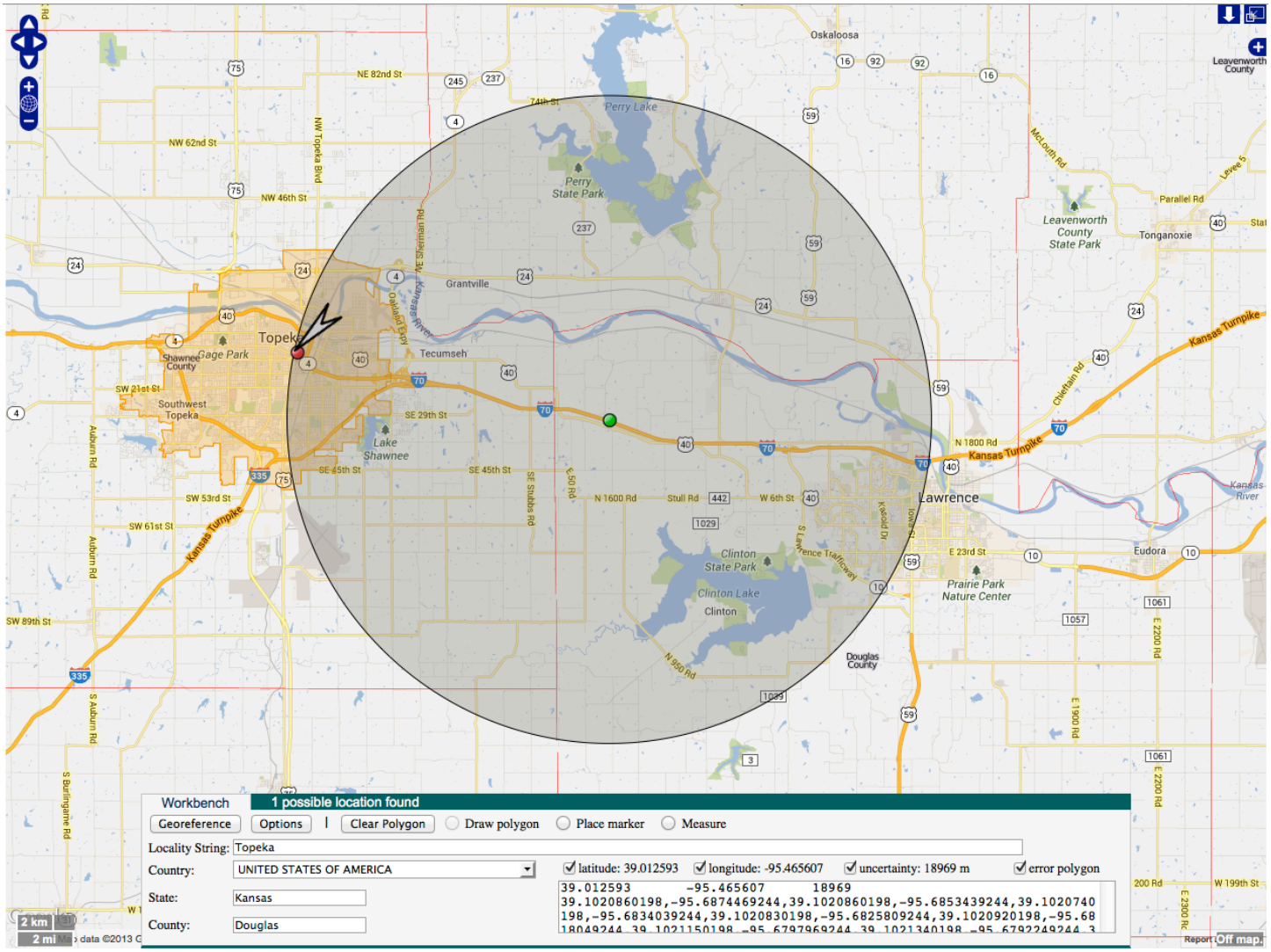


Figure 13 Example between two named places (Location: Along I-70 between Topeka and Lawrence)

Offset (direction only, no distance) *e.g. N of Baldwin City, Douglas, Kansas*

Use GEOLocate or other gazetteer to find the named place. Find the nearest named place in the direction specified and move the lat-long until it is half way between the two, resize the uncertainty until the radius is half the distance between the two named places.

Offset (offset only, no direction) *e.g. 5 miles from Baldwin City, Douglas, Kansas*

Use GEOLocate or other gazetteer to find the lat-long of the named place.

Use the Georeferencing calculator to find the error (you provide the lat-long, calculate "Error only")

Offset (offset at a heading) *e.g. 2 miles N of Oskaloosa, Jefferson, Kansas*

CAUTION!

1) GEOLocate will not read "1/2 mile" or "1/4 mile" - change them to 0.5 or 0.25 in Specify.
2) Save your changes in Specify before clicking GEOLocate, because it will not read the changes until you do.

If you have one simple offset, GEOLocate will return results if it can find the named place. If the results are plotted with an offset polygon, you can be confident that the uncertainty is correct.

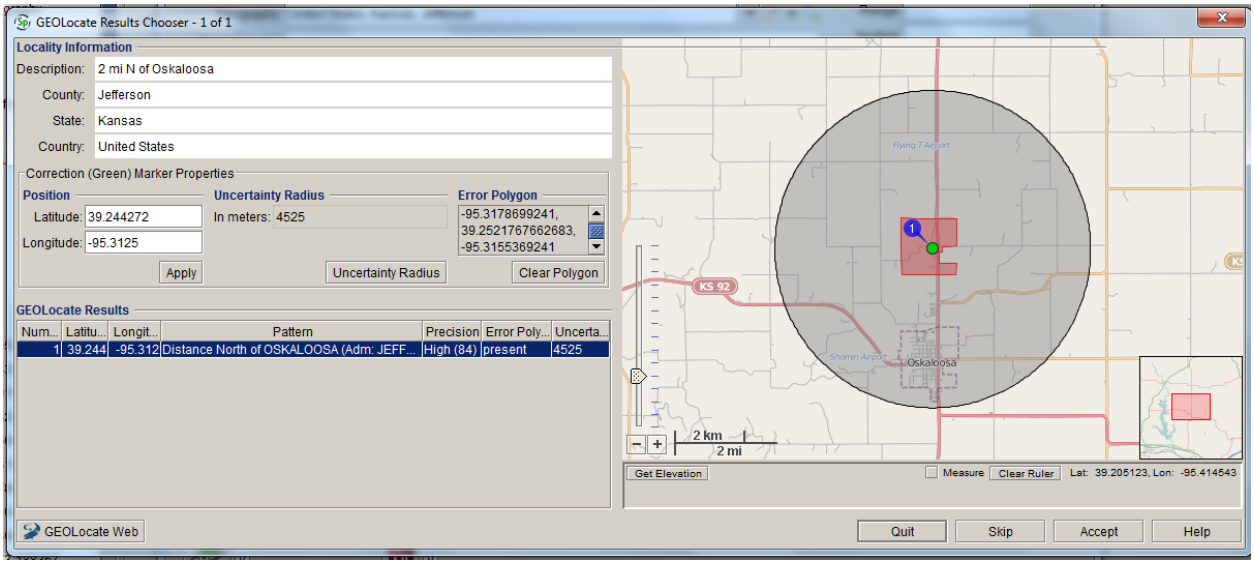


Figure 14 Offset from a named place, where the named place had a polygon (location: 2 miles N of Oskaloosa, Jefferson, Kansas). Accept the results, but clear the polygon beforehand, we don't want to record the polygon for offsets.

However, if you get an uncertainty circle, but no offset polygon, be cautious – GEOLocate is probably calculating the uncertainty based on a standard uncertainty for whatever feature you have. For example, with 2 miles N of Midland (see Figure 7), GEOLocate would calculate uncertainty based on a named place extent of 3036m.

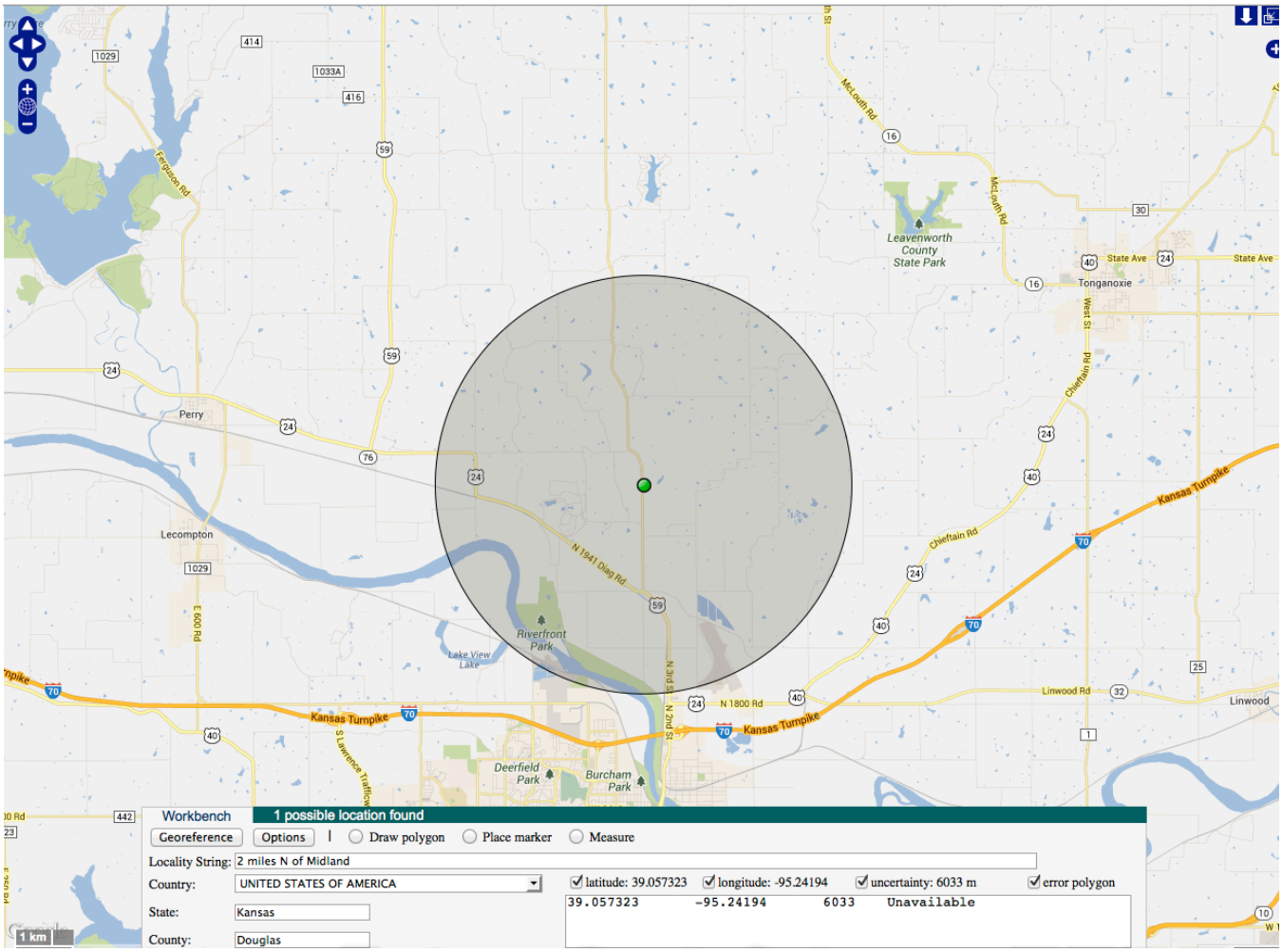


Figure 15 Offset from a named place that has no polygon - do not accept this result!

In this case, you need to determine the extent of the named place first – this could either be the distance to the nearest named place, or you could decide that there is a clear boundary to the town, even if there is no pre-defined polygon available.

Use the georeferencing calculator to determine uncertainty (distance at a heading).

If you have already determined extent and uncertainty for the named place in anther locality, be sure to save time by using that information.

Offset (along a path) *e.g. 6 miles E of Baldwin City, along highway 56, Kansas*

Use GEOLocate to find the lat-long and use the measuring tool to measure along the path in question (usually a road). Alternatively, use Google Maps or another gazetteer. Use the Georeferencing calculator to determine error.

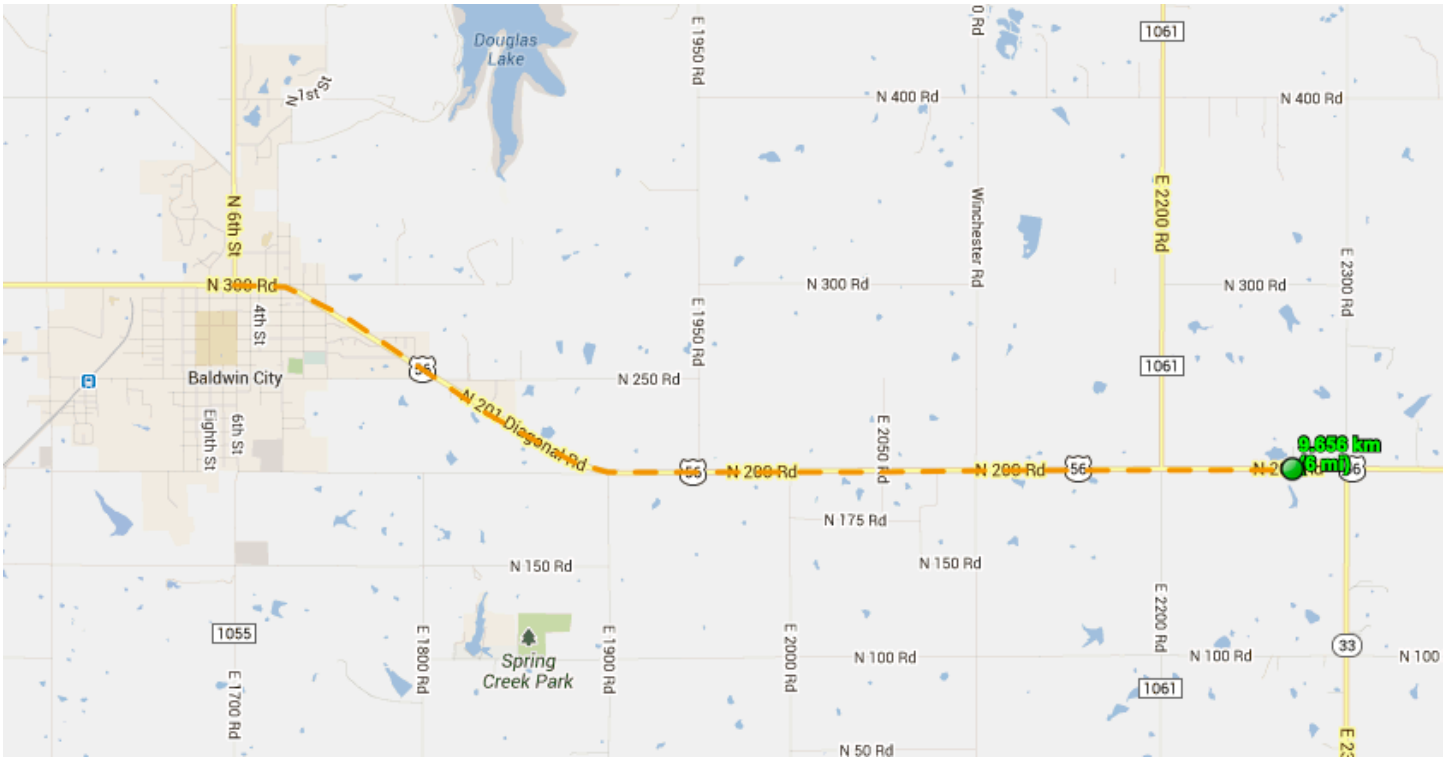


Figure 16 Distance along a path measured in GEOLocate (location: 6 miles E of Baldwin City along highway 56). Use the georeferencing calculator to determine uncertainty.

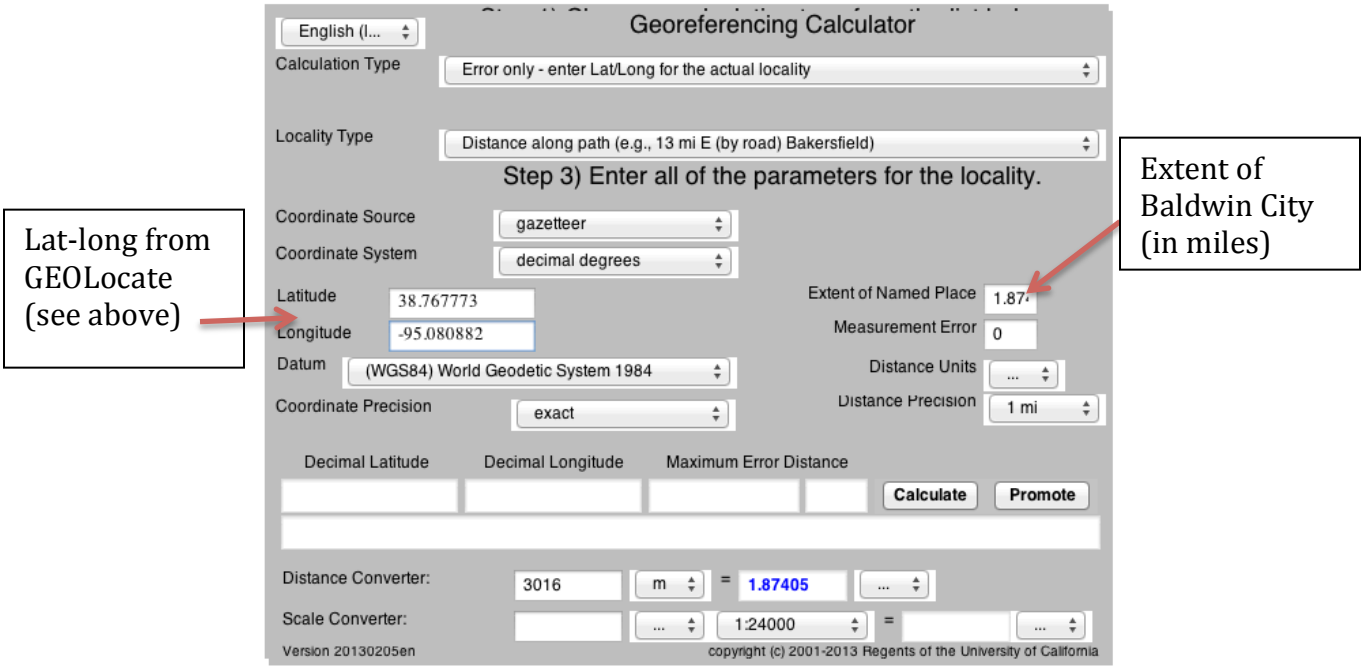


Figure 17 Calculating uncertainty for 6 miles E of Baldwin City along highway 56 – Error only, distance along a path.

Offset (in orthogonal directions) *e.g. 2 miles N and 3 miles W of Baldwin City*

Use Geolocate or other gazetteer to find the lat-long and uncertainty of the named place, and use the georeferencing calculator to determine the coordinates and uncertainty. Verify the coordinates by plotting on Google Earth, or other gazetteer.

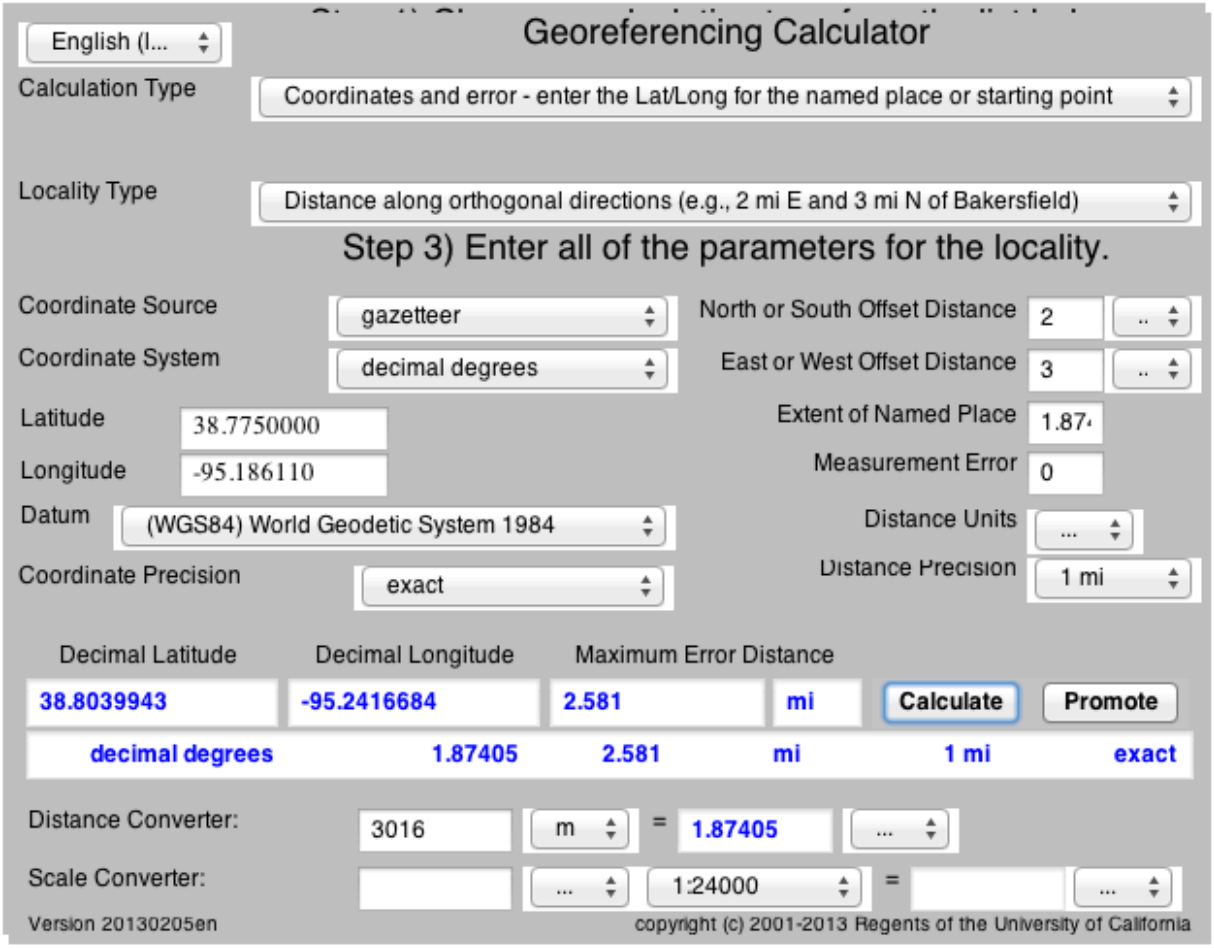


Figure 18 Georeferencing calculator example - orthogonal offsets. Location: 2 miles N and 3 miles W of Baldwin City

Offset (from two distinct paths)

Follow the protocol from the Georeferencing Quick Reference Guide. Use GEOLocate or other gazetteer to find the lat-long: find the intersection from the two directions. Use the georeferencing calculator to determine error.

Public Land System Survey (PLSS) data: township, range, section (TRS)

Many of our localities have Township-Range-Section reported, and it is often the most precise part of the locality.

Some of the terminology is illustrated below. Center may be abbreviated to "C", and sometimes "middle" or "mid" is used instead. There may be up to four subdivisions in a section e.g. NE1/4, NW1/4, NE1/4, SE1/4, which should be read as "the NE1/4 of the NW1/4 of the NE1/4 of the SE1/4". "Side" is somewhat amibiguous - we usually interpret it to mean the edge, such that center W edge, center W side and center W line are equivalent, for example.

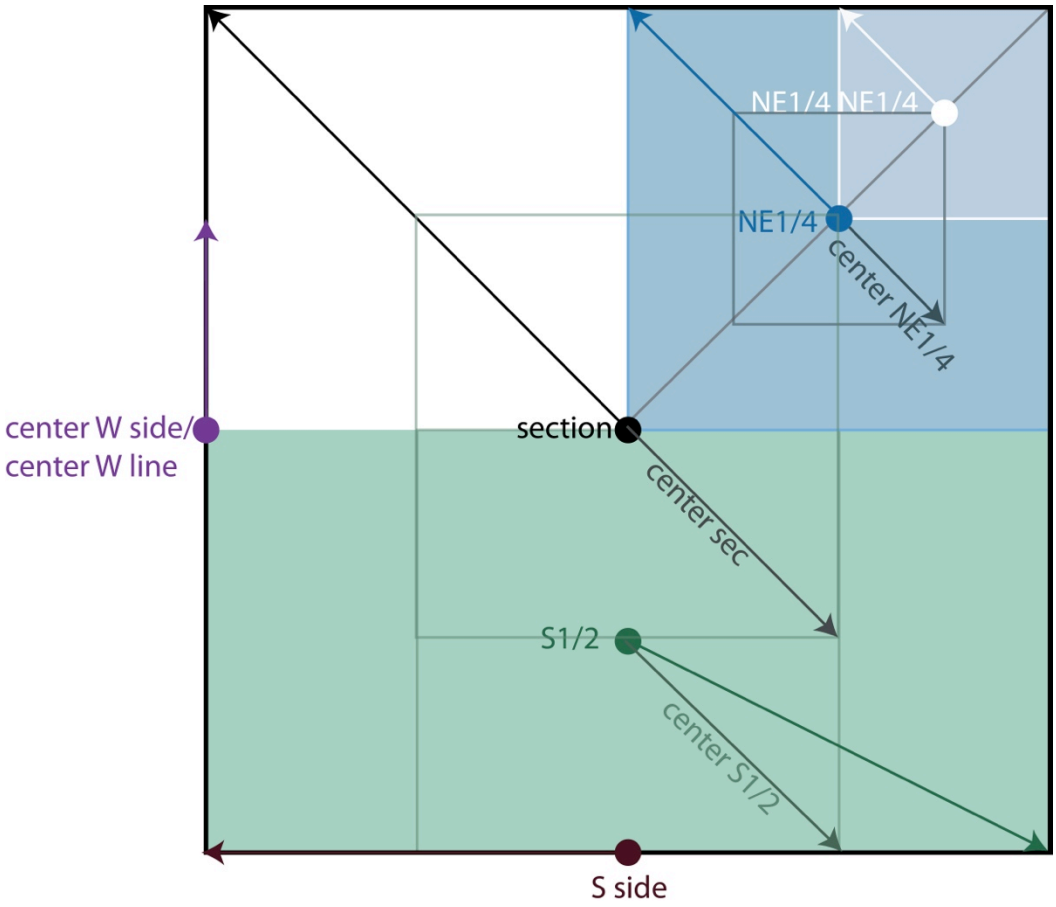


Figure 19 Subdivisions in a standard square section (N.B. not all sections are square!). Arrowed lines represent the uncertainty for each of the subdivisions.

1) First, try GEOLocate. If the location is in the correct format GEOLocate will plot TRS, to the section.

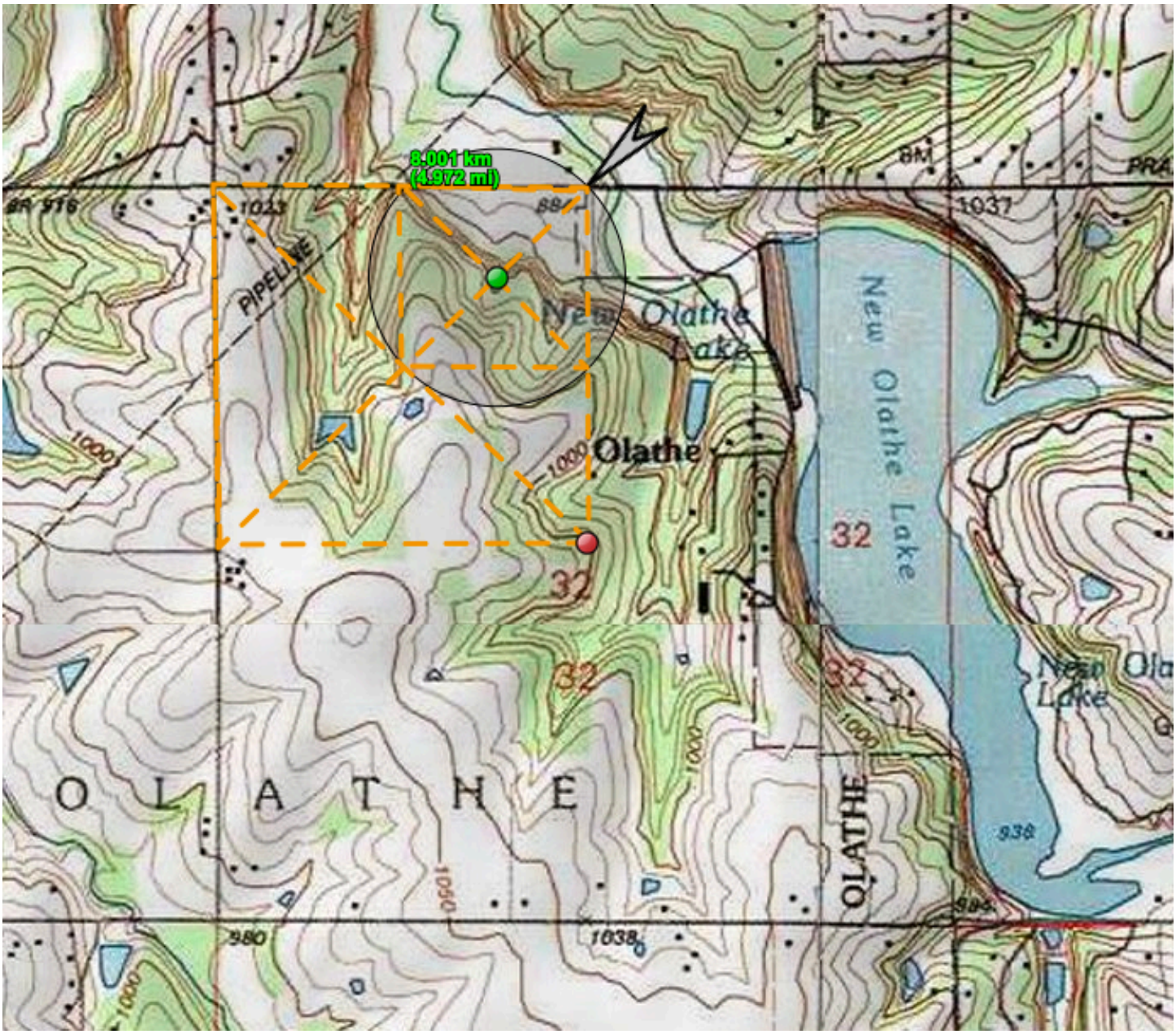


Figure 20 Example TRS location. The location was NE1/4 NW1/4 sec 32 T13S R23E, Johnson County, KS. GEOLocate plotted the center of the section. Then using the measuring tool it's possible to map out the NE ¼ of the NW¼, move the lat-long and resize the uncertainty to include all of that ¼ ¼ section

2) The second method is to use Earth Point.

Open Earth Point, on the left hand menu, under “USA utilities” and “Township and Range”, go to “search by description”

Enter the state, and the TRS. Click “View” and it will show you the coordinates of the centroid, the area and the corner coordinates for the township and for the section. Click “Fly to on Google Earth” and it will plot the section on Google Earth.

From there, you can map the section part (see below)

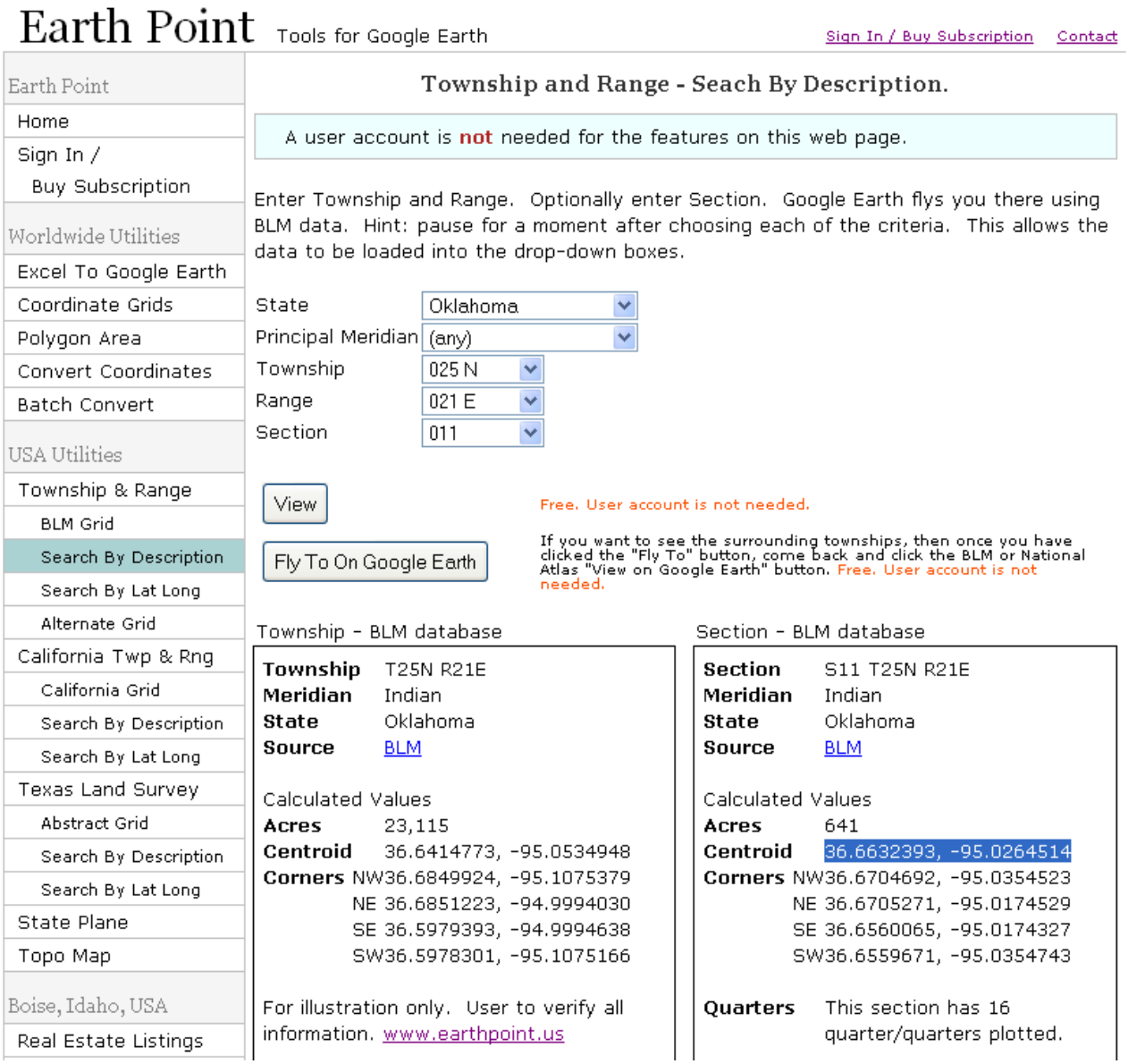


Figure 21 TRS data can be entered into Earth Point to generate Lat/Long coordinates for both the centroid of the range and the section.

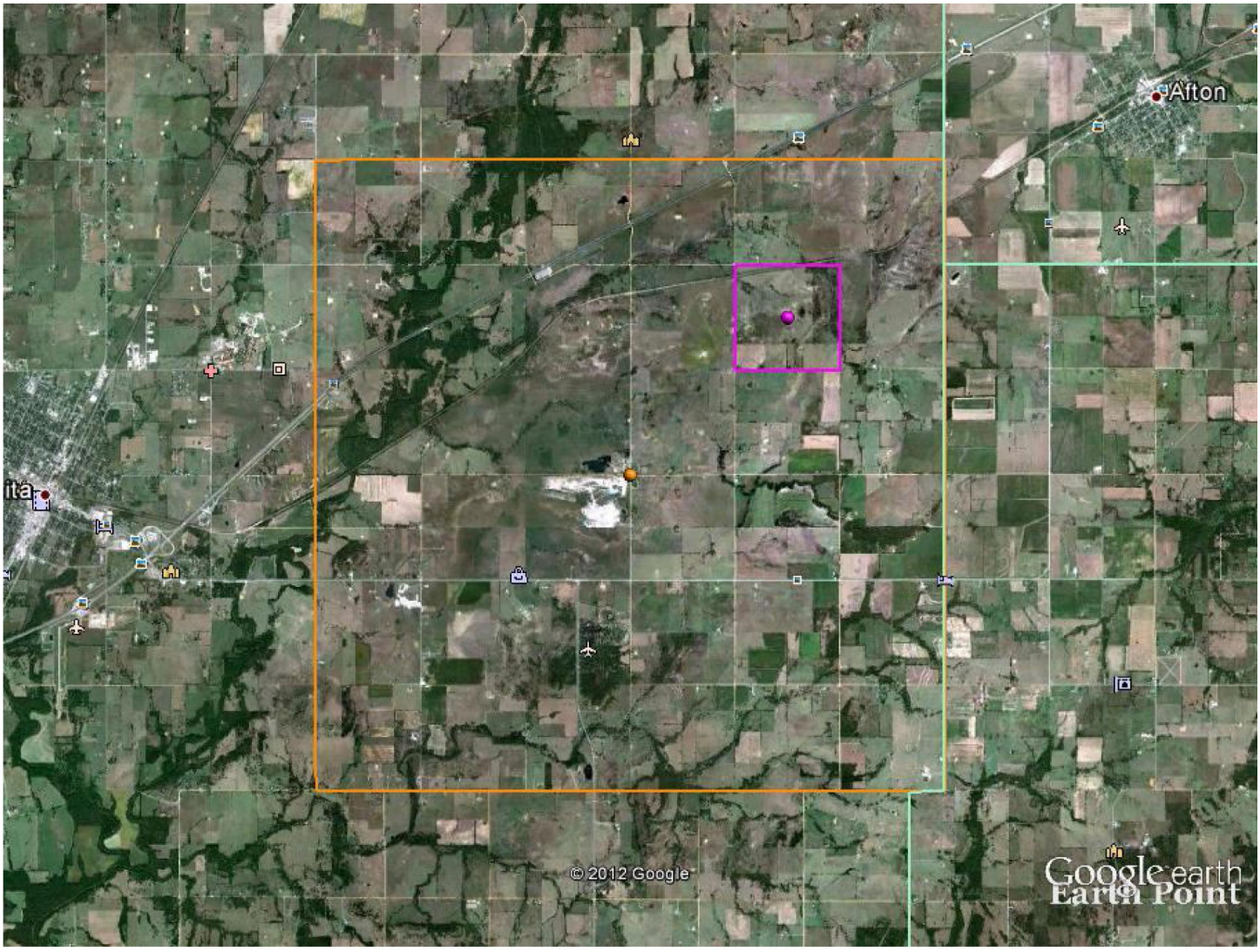


Figure 22 "Fly-to on Google Earth" will plot the township and section boundaries

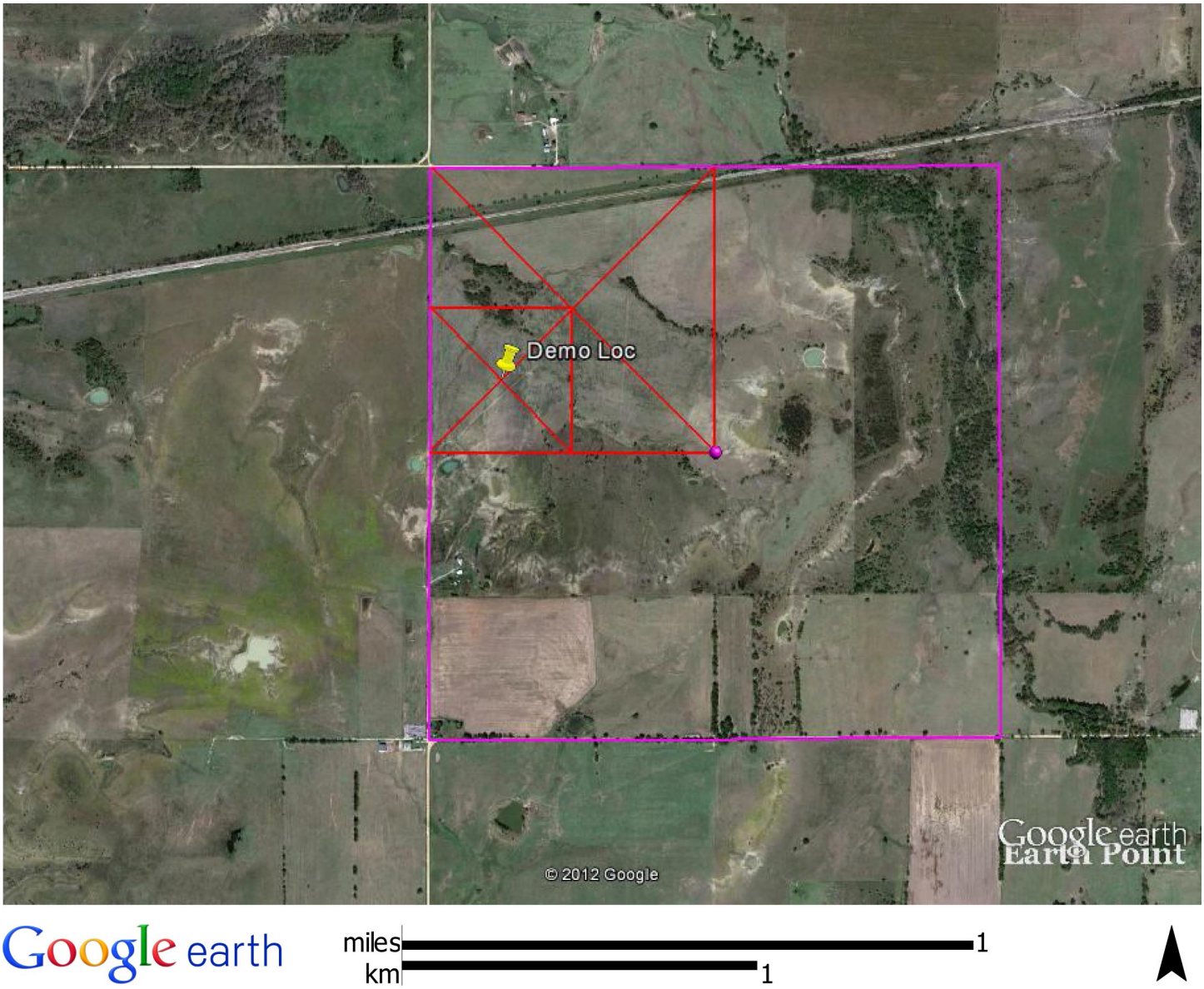


Figure 23 Manually plot the quarter section (and any further divisions) on Google Earth.

Uncertainties for a standard sized section 1mile x 1mile are reported below. Not all sections are a standard square, however, so be cautious and if necessary measure uncertainty yourself, as you would for a named place.

Division	Example	Extent
Township	T6S R14E	6828 m.
Section	Sec. 23 T6S R14E	1138 m.
½ Section	S1/2 Sec. 23 T6S R14E	900 m.
¼ Section	SW1/4 Sec. 23 T6S R14E	570 m.
¼ of ¼ Section	NE 1/4 SW1/4 Sec. 23 T6S R14E	285 m.
¼ of ¼ of ¼ Section	SW 1/4 NE 1/4 SW1/4 Sec. 23 T6S R14E	100.6 m.

One locality, multiple types

Lots of localities have long descriptions with many different parts - distance at a heading from a named place, quarry name, and TRS for example.

First, check that all the pieces are consistent, if they aren't and there is no obvious mistake, then do not georeference. If they are consistent, then georeference as precisely as possible. The TRS often provides the most detailed information.

For example: 1/2 mi SE of Howard, SW1/4 SEC 06 T30S R11E, Elk County, Kansas. In this case the TRS is approximately 0.5 SE of Howard, but the uncertainty for the ¼ section is smaller than the uncertainty for "0.5 mile SE of Howard".

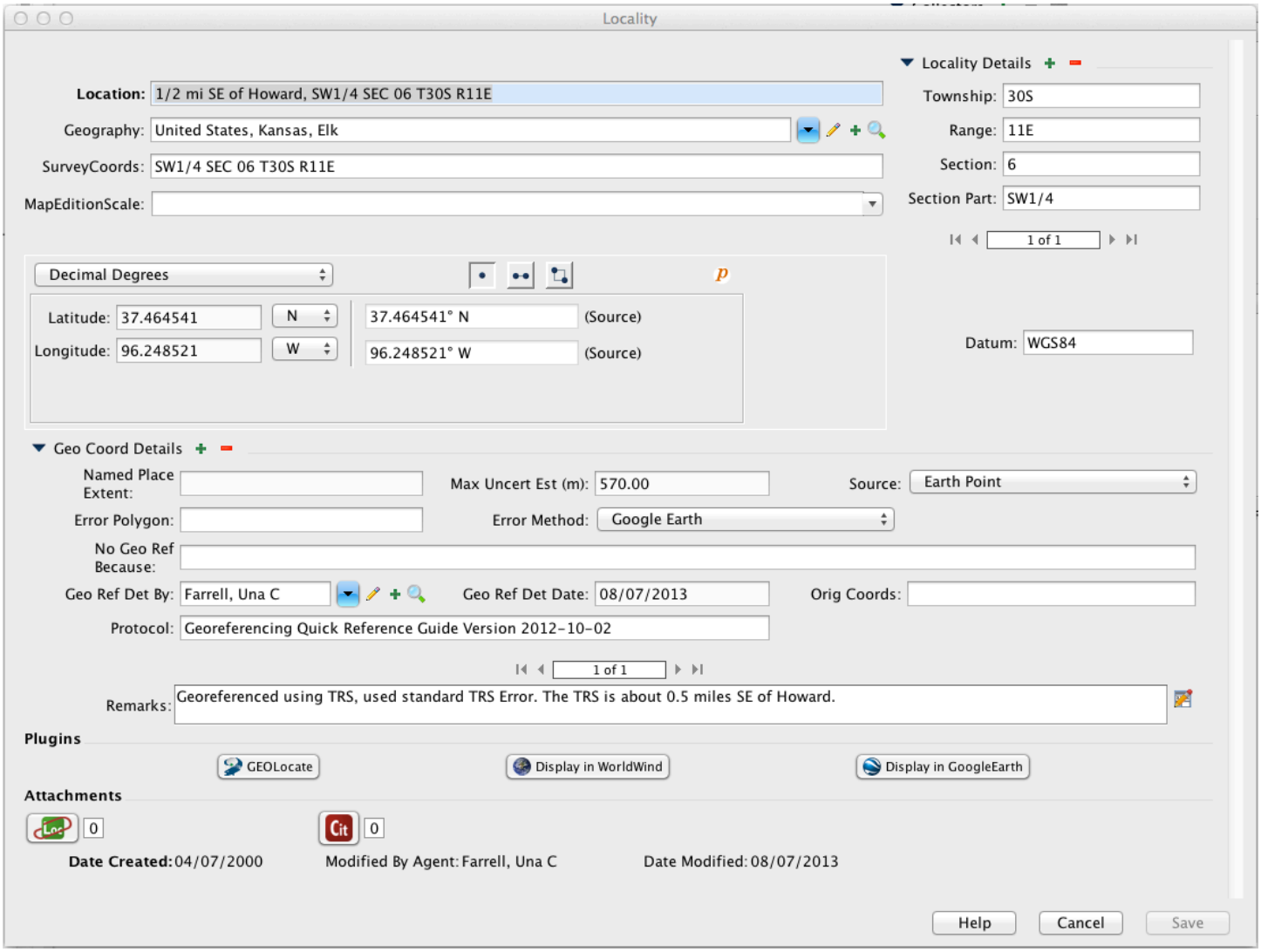


Figure 24 Completed georeference for "1/2 mile SE of Howard, SW1/4 Sec06 T30S R11E, Elk County, Kansas

No georeference because

If you cannot georeference the locality, fill in the "No Geo Ref Because" field, and add your name and date. The "No Geo Ref Because" is a relatively short text field - copy and paste into the remarks field as well, and add further details there if necessary. Some reasons not to georeferenced are described below, use consistent description if possible so that they can be found and revisited if necessary. For example:

1) **Contradictory Information**. For example,SW1/4 sec 29, T16S, R02E, United States, Kansas, Franklin". The TRS plots in Dickinson county.
2) **Dubious** – This can occur when the locality description explicitly states that the information contained therein is in question, or when the location is not well enough bounded or specific enough to identify a meaningful location (e.g., 'possibly Lawrence, Kansas' or 'Turnpike, Kansas' Kansas, or Kansas?).
3) **Needs research** – when you run out of time. We can revisit these localities if they are judged important. These locations probably could be found with additional resources but may not be worth the added time, especially if there are few (or no) collection objects associated with the locality. (e.g., "about 5 miles SW ccc 1763, United States, Kansas, Jefferson". Internet research reveals that CCC refers to the Civilian Conservation Corps. Company 1763 was stationed at site SCS-9, but the exact location of camp SCS-9 would take additional research to determine.
4) **Cannot be located** – the locality cannot be distinguished from among many possible candidates (e.g., "Spring Creek, Kansas", see above) or there is not enough information to find the locality e.g., Murphy Farm).